Section: Orthopedics

Original Research Article

COMPARATIVE PROSPECTIVE STUDY OF PROXIMAL FEMUR NAIL VERSUS DYNAMIC HIP SCREW IN THE TREATMENT OF INTERTROCHANTERIC FEMUR FRACTURE

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ABSTRACT

Background: Aim: To compare the outcome of Intertrochanteric fractures of femur by using Proximal femoral nail and Dynamic hip screw procedures.

Materials and Methods: The study was conducted in Government General Hospital, Nalgonda Telangana from October 2018 till September 2020 where patients with 50 intertrochanteric fractures were selected. The patients were evaluated as per the history, and mode of injury. Necessary radiological investigations and hematology profile was done on admission. Type of surgery and details were noted. The immediate post - operative x - rays were evaluated. All the cases were again evaluated through clinical and radiological methods at 4 weeks 8 weeks,12 weeks,6 months,1 year,1year 6 months for any morbidity and mortality.

Results: In the present study, majority of the patient in our study were between 61 -80 years with a mean age of 62 .6 years. Fifty-two percent of the patients were female. Trivial fall was the most common mode of injury. Left hip was involved in 58. 0% of the patient. Stable fracture constituted 56% of the cases; unstable fractures 44 percent. Twenty five patients treated with PFN and 25 treated with DHS fixation were included in the study. The PFN required shorter incisions, less blood loss and operative times. The DHS required 16. 25sec less fluoroscopy time. Post-operative complications in both group included malunion and infection, 5 malunion in DHS while 1 in PFN, 2 wound infection in DHS while 1 in PFN. One screw back out in DHS.17 of the 25 patient treated with PFN and 6 of the 25 patient treated with DHS regained their pre injury walking abilit y at the fourth month of follow up. Patients treated with PFN had a significantly lower pain score at the sixth month of follow up. Patients treated with DHS had more limb length shortening as compared to those treated with PFN.

Conclusion: The outcomes of the stable fractures treated with either DHS or PFN were similar Unstable intertrochanteric fractures, treated with PFN, had significantly better outcomes with all patients having good results. We conclude that in stable intertrochanteric fractures, both the PFN and DHS have similar outcomes. However, in unstable intertrochanteric fractures the PFN has significantly better outcomes in terms of earlier restoration of walking ability. In addition, as the PFN requires shorter operative time and a smaller incision, it has distinct advantages over DHS even in stable intertrochanteric fractures. Hence, in our opinion, PFN may be the better fixation device for most intertrochanteric fracture of femur.

Keywords: DHS, PFN, intertrochanteric fracture of femur, Post-operative complications.

INTRODUCTION

Intertrochanteric (IT) fractures of femur are commonly seen in elderly patients over the age of 70 years.1Incidence of these fractures has increased primarily due to increasing life span and more sedentary life style brought about by urbanization.

In younger patients Intertrochanteric fractures of femur occur due to high velocity trauma like road traffic accidents (RTA), whereas in older patients it is due to trivial trauma.2Incidence of Intertrochanteric fractures of femur is common in females than in males, because senile osteoporosis sets in female early.[3]

Intertrochanteric fractures can be managed by, conservative (or) operative methods. Conservative methods were the treatment of choice until 1960, before the introduction of new fixation devices. Conservative methods resulted in higher mortality rates ranging between 15-20%, and also complications like, decubitus ulcers, urinary tract infections, pneumonia, thrombo-embolic complications.

Hence, these methods are only indicated in conditions such as age related chronic medical conditions unfit for surgery and for non- ambulatory patients before sustaining fracture.[4,5]

Operative management for Intertrochanteric fractures of femur includes extra- medullary (sliding hip screw with barrel plate- DHS and its variants) and intramedullary nailing procedures (proximal femoral nail- PFN).

DHS with side plate assembly is the most commonly used device, for fixation of intertrochanteric fractures.

It is a non-collapsible fixation device, which permits the proximal fragment to collapse or settle on fixation device seeking its own position of stability. However, the disadvantages such as large skin incision and more soft tissue dissection with greater blood loss replaced its use with PFN.[6] PFN is the latest implant for management of IT fractures of femur. This implant is cephalo medullary and has many potential advantages.

Being intramedullary, load transfer is more efficient, shorter lever arm results in less transfer of stress and less chances of implant failure, the amount of sliding is limited by intramedullary location, therefore less chances of shortening and deformity. Shorter operative time, less soft tissue dissection and less blood loss and advantages of controlled impaction can be maintained.[2]

In view of these conditions, this study has been taken up to compare the outcome of Intertrochanteric fractures of femur by using Proximal femoral nail and Dynamic hip screw procedures.

Aims of the study

1. To compare the surgical treatment of intertrochanteric fractures of the femur with the Proximal femoral nail and Dynamic hip screw device,
2. To evaluate the functional and anatomical end results of both procedures.

We chose the surgical management of Inter trochanteric fractures with either

a) Dynamic Hip Screw fixation (DHS) OR

b) Proximal Femur Nailing. (PFN)

Initial Management

As soon as the diagnosis is made by Radiographic evidence as Inter trochanteric fracture, the affected limb is immobilized by applying.

1. Above Knee Skin traction.
2. Intra Muscular analgesic medication is given at regular intervals.

Antibiotic medication is given when required.

MATERIALS AND METHODS

The study was conducted in Government General Hospital, Nalgonda, Telangana from October 2018 till September 2020 where patients with 50 intertrochanteric fractures were selected.

Inclusion Criteria

All patients with fresh intertrochanteric fracture and who were able to walk prior to the fracture were included in the study.

1. Age > 18 years.
2. Sex – Both sex (male, female)

Exclusion Criteria

Patients with

a) Pathological fracture,

b) Active infection,

c) Unstable medical illness

The patients were evaluated as per the history, and mode of injury. Necessary radiological investigations and hematology profile was done on admission. Type of surgery and details were noted. The immediate post - operative x - rays were evaluated. All the cases were again evaluated through clinical and radiological methods at 4 weeks 8 weeks,12 weeks,6 months,1 year,1year 6 months for any morbidity and mortality.

Descriptive and comparative study of functional outcome following surgical management of intertrochanteric fractures with either proximal femoral nailing or dynamic hip screw fixation.

A sample of size 50 was selected using purposive sampling technique.

25 patients have undergone proximal femoral nailing.

25 patients have undergone dynamic hip screw fixation.

The mode of injury were classified under 3 different categories taking into consideration whether the injury was due to a road traffic accident, trivial fall or a fall from height . 8 out of 50 cases the mode of injury was due to road traffic accident .The youngest patient in the series was aged 32 years and the oldest was 86 years.

The pre-injury walking ability was recorded as per the classification of Sahlstrand 74. Antero-posterior and lateral radiographs of the affected hip were taken.

The patients were then put on Above Knee skin

traction. All the patients were initially evaluated as to their general condition; hydration and corrective measures were undertaken. The fractures were classified as per Jensen and Michealsen's modification of Evans classification of intertrochanteric fractures. Type I and type II were considered as stable fractures and type III, IV and V were considered as unstable fractures. No open fractures were encountered in this series. Patients were taken up for surgery on next elective OT day. Adequate blood transfusion and other supportive measures were given depending on the preoperative condition.

The fractures were fixed with either dynamic hip screw fixation or proximalfemoral nailing. Allocation of the fractures to each treatment group was done by surgeon prefernce. Of the 50 patients in the study, 25 were treated with dynamic hip screw fixation and 25 with proximal femoral nailing. The length of the incision, duration of surgery, blood loss and fluoroscopy time was recorded intra operatively.

Prophylactic medications

All patients received injectable antibiotic (cephalosporins) given one hour before surgery and continued post operatively for 2 to 3 days. Oral cephalosporins were continued for next 3 to 4 days. Aminoglycosides were added intraoperatively if the procedure were prolonged. Analgesic was initially given in IV or IM route for 2 to 3 post operative days and then orally for few days. We did use low molecular weight heparin as an anti deep vein thrombosis prophylaxis only in few of our patients.

Pre– Opassessment

1. All the patients under went blood investigations
- Hb %.
- Blood Grouping.
- Total blood count.
- Viral profie for HIV. HBs Ag.
- Chest X Ray
- ECG
- Physician opinion for fitness of surgery and
- Pre Anaesthetic Check up is done.

Postoperative care

All patients were given peri - operative antibiotics for 24 to 48 hours and deep venous thrombosis prophylaxis. Patients were allowed to sit up in bed on the second post -operative day. Static quadriceps exercises where started on the second and third post –operative days.

Weight bearing

Patients were mobilized non - weight bearing as soon as the pain or general condition permitted. Weight bearing was commenced depending upon the stability of the fracture and adequacy of fixation, delaying it for patients with unstable or inadequate fixation.

Follow up

All the patients were followed up at 1 st month, 2 nd month, 3 rd month, 6 months, 1 year, and 1 year 6 months and check x - rays were taken to assess fracture union and designs of failure of fixation. Walking ability of each patient was recorded and compared with pre-injury walking ability using the Sahlstrand,[7] grading. Post-operative pain was evaluated using the four -point pain score as also used by Saudan.[9] The fracture union was considered as malunion if varus angulation was greater than 10 degrees.

Functional Assessment,[36]

The functional outcome was assessed based on the HARRIS HIP SCORING METHOD,[9] as follows:

Pain

1. None/Able to ignore it (44 points)
2. Slight, occasional, no compromise in activity (40)
3. Mild, no effect on ordinary activity, pain after usual activity, use30)
4. Moderate, tolerable, makes concessions, occasional narcotic (20)
5. Marked, serious limitations (10)
6. Totally disabled (0)

Function: Gait Functional Activities Limp Stairs

□None	(11)	□Can go up/down normally (4)	
□Slight	(8)	□Can go up/down normally with banister	(2)
□Moderate	(5)	□Any method (1)	
□Severe	(0)	□Unable to do stairs (0)	

Support

□None (11)
□Cane for long walks (7)
□Cane all the time (5)
□Crutch (3)
□2 canes (2)
□2 crutches or not able to walk (0)

Socks/Shoes

□With ease (4)
□With difficulty (2)
□Unable (0)

Sitting

□Any chair, 1 hour (5)
□High chair, ½ hour (3)
□Unable to sit, ½ hour, any chair (0)

DistanceWalked

□Unlimited (11)
□6 block (8)
□2-3 blocks (5)
□Indoors only (2)
□Bed and chair (0)

PublicTransportation		
□Able to enter public transportation (1)		
□Unable to use public transportation (0)		
AbsenceofDeformity (All yes = 4; Less than 4 =0)		
Less than 30° fixed flexion contracture	Yes	No
Less than 10° fixed abduction	Yes	No

Less than 10° fixed internal rotation in extension	Yes	No
Limb length discrepancy less than 3.2 cm	Yes	No

RangeofMotion (*indicates normal) Support Flexion (*140)__
Abduction (*40°) ____
Adduction (*40°) ____
External Rotation (*40°) __
Internal Rotation (*40°) __
Range of Motion scale211° - 300° (5)
161° - 210° (4)
101° - 160° (3)
61° - 100 (2)
31° - 60° (1)
0° - 30° (0)
Range of Motion Score ___

Total scores are out of 100 and grouped as follows:
90 -- 100 Excellent
80 – 89 Good
70 -- 79 Fair
60 – 69 Poor < 60 Failed Any score above 60 is acceptable, although the higher the score, the better the patient's overall adjustment after the surgery.

Statistic Alanalysis

The collective data analysed by the Z -test, Student t -test, Chi -),[10,9] Wilcoxon signed rank sum test and the Mann Whitney U test using SPSS software to evaluate the results.

RESULTS

Table 1: Age Distribution

AGE (years)	Method of DHS	fixation PFN	total
21-40	4 (16 %)	4(16%)	8 (16%)
41-60	6 (24 %)	4(16%)	10 (20 %)
61-80	11(44 %)	15 (60%)	26 (52%)
81-100	4 (16%)	2(8%)	6(12%)
TOTAL	25 (100%)	25 (100%)	50 (100%)
MEAN + SD	62.6 ± 16.34	62.68 ± 14.28	P = 0.935 NS

Table 2: Sex distribution

	METHOD OF DHS	FIXATION PFN	TOTAL
MALE	11 (44%)	13 (52%)	24(48%)
FEMALE	14 (56%)	12 (48%)	26 (52%)
TOTAL	25 (100%)	25 (100%)	50 (100%)

Table 3: Mode of injury

	METHOD OF FIXATION		TOTAL
	DHS	PFN	
FALL FROM HEIGHT	3 (12%)	3(12 %)	6 (12%)
RTA	3 (12 %)	5 (20%)	8 (16%)
TRIVIAL FALL	19 (76%)	17(68%)	36 (72%)
TOTAL	25 (100%)	25 (100%)	50(100%)

Table 4: Side of injury

	METHOD OF FIXATION		TOTAL
	DHS	PFN	
LEFT	12 (48%)	17 (68%)	29(58%)
RIGHT	13 (52%)	8 (32%)	21 (42%)
TOTAL	25 (100%)	25 (100%)	50 (100%)

Table 5: Type of fracture

TYPE OF FRACTURE	METHOD OF FIXATION		TOTAL
	DHS	PFN	
Type 1	1 (4%)	0 (0%)	1(2%)
Type 2	11 (44%)	16(64%)	27 (52%)
Type 3	10 (40%)	5 (20 %)	15 (30%)
Type 4	3 (12%)	4 (16%)	7 (14%)
Type 5	0 (0%)	0 (0%)	0(0%)
TOTAL	25 (100%)	25(100%)	50(100%)

Table 6: Pre injury walking ability

	METHOD OF DHS	FIXATION PFN	TOTAL
GRADE 1	20 (80%)	18 (72%)	38 (76%)
GRADE 2	5 (20 %)	7 (28%)	12 (24%)

GRADE 3	0 (0%)	0 (0%)	0 (0%)
GRADE 4	0(0%)	0 (0%)	0 (0%)
TOTAL	25(100%)	25 (100)	50 (100) %

Table 7: Intraoperative variables length of incision

METHOD	Number of patients	MEAN (CM)	STD DEVIATION	T= 22.569
DHS	25	16.15	16.15+/- 1.34	
PFN	25	8.1	8.10+/- 0.85	P HS = 0.0001

Patient treated with PFN required a significantly smaller skin incision.

Table 8: Duration of Surgery

METHOD	Number of patients	MEAN (CM)	STD. DEVIATION	T -8.225
DHS	25	87.25	87.25+/-9.66	
PFN	25	69.5	69.50+/- 9.58	P=0.0001 HS

PFN required mean 18 minutes less operative time than DHS

Table 9: Fluoroscopy time

METHOD	Number of patients	MEAN (SEC)	STD.DEVIATION	Z
DHS	25	57.5	57.5 +/- 3.8	24.59
PFN	25	73.75	73.75 +/- 9.98	P=0.0001 HS

Dynamic Hip Screw fixation required significantly less fluoroscopic time as compared to Proximal Femur Nailing.

Table 10: Blood loss (intraoperative)

METHOD	Number of patients	MEAN (ml)	STD. DEVIATION	Z
DHS	25	375	375 +/- 63.86	HS
PFN	25	140	140 +/- 34.79	P=0.0001

Proximal Femur Nailing had significantly less intra Operative blood loss compared to Dynamic Hip Screw fixation.

Table 11: Postoperative Complications

	METHOD OF FIXATION		TOTAL
	DHS	PFN	
MAL UNION	5(20%)	1 (4%)	6 (12%)
WOUND INFECTION	2 (8 %)	1 (4%)	3 (6%)
SCREW BACK OUT	1 (4%)	0(0%)	1 (2%)

p = 0 .605 NS

Malunion was seen in 25% of the patient in DHS group while there was 5% malunion in the PFN group.

-Wound infection was seen in 2 patients in the DHS group and in 1 patient in the PFN group.

-One screw back out was seen.

Table 12: Post-operative pain

PAIN SCORE	METHOD OF FIXATION		TOTAL
	DHS	PFN	
1	4 (16%)	10 (40%)	14 (28%)
2	9(36%)	13 (52%)	22(44%)
3	9(36%)	2(8%)	11(22%)
4	3(12%)	0(0%)	3(6%)
TOTAL	25(100%)	25 (100%)	50 (100%)

p=0 .012 S

Table 13: Post-operative mobility score

METHOD		Number of patients	MEAN	STD.DEVIATION	Z	P
DHS	Pre operative mobility score	25	1.20	0.4577	2.879	0.004 S

	Post operative mobility score	25	2.25	0.5936		
PFN	Pre operative mobility score	25	1.15	0.4140	2.530	0.011 S
	Post operative mobility score	25	1.45	0.5936		

Fourteen patients in the PFN group regained their pre –injury walking ability at third month follow up as compared to five in the DHS group.

Table 14: Post-operative shortening

METHOD	Number of patients	MEAN (CM)	STD. DEVIATION	Z
DHS	25	1.25	0.75	2.597
PFN	25	0.575	0.56	P= 0.003 S

Significantly less limb length shortening was seen in the PFN group as compared to the DHS group with a mean of 1.25 cms. in the DHS and 0.575cms in the PFN.

Table 15: Post-operative range of movement

METHOD			Number of patients	MEAN (DEGREE)	STD.DEVIATION	T=
Range of motion		DHS	25	84.25	20.53	2.12
		PFN	25	98.75	10.11	P=0.07 S

There were significantly better mean post-operative range of movement in PFN than DHS with 84.25 degree mean in DHS group and 98.75 degree mean in PFN group.

Table 16: Time of fracture union

METHOD	N	MEAN (WEEKS)	STD DEVIATION	T= 0.4865
DHS	25	12	1.71	
PFN	25	12.15	1.42	P= 0.765 NS

All the fracture united at a mean of 12. 075 weeks

Table 17: functional outcome

	METHOD OF FIXATION		Total
	DHS	PFN	
EXCELLENT	4 (16%)	6 (24%)	10 (20%)
GOOD	9 (36%)	17 (68%)	26 (52%)
FAIR	8 (32%)	2 (8%)	10 (20%)
POOR	4 (16 %)	0 (0%)	4 (8%)
TOTAL	25 (100%)	25 (100 %)	50 (100%)

P = 0.012 S

Table 18: Functional outcome vs type of fracture fixation with DHS

	Type of Fracture					
	T1	T2	T3	T4	T5	Total
EXCELLENT	1	3	0	0	0	4
GOOD	0	7	2	0	0	9
FAIR	0	0	7	1	0	8
POOR	0	1	1	2	0	4
TOTAL	1	11	10	3	0	25

Table 19: Functional outcome vs type of fracture fixation with PFN

	TYPE OF FRACTURE					
	T1	T2	T3	T4	T5	TOTAL
EXCELLENT	0	4	1	0	0	5
GOOD	0	12	3	4	0	19
FAIR	0	0	1	0	0	1
POOR	0	0	0	0	0	0
TOTAL	0	16	5	4	0	25

Table 20: Functional outcome vs method of fixation stable fractures

	METHOD OF FIXATION		TOTAL
	DHS	PFN	
EXCELLENT	4 (33.3 %)	4(25%)	8 (28.57 %)
GOOD	7 (58.3 %)	12 (75%)	19 (67.8 %)
FAIR	0(0%)	0(0%)	0(0%)
POOR	1 (8.33%)	0(0%)	1 (3.5%)
TOTAL	12 (100%)	16 (100%)	28 (100%)

P=0.56 NS

Table 21: Functional outcome vs method of fixation unstable fractures

	METHOD OF FIXATION		TOTAL
	DHS	PFN	
EXCELLENT	0 (0%)	1 (11.1%)	1 (4.5%)
GOOD	2 (15.38 %)	7 (77.8 %)	9 (40.9 %)
FAIR	8 (61.50 %)	1(11.1 %)	9 (40.9 %)
POOR	3 (23.0 %)	0 (0%)	3 (13.63%)
TOTAL	13 (100 %)	9 (100%)	22 (100 %)

P = 0.04 S

DISCUSSION

The goal of the study was to compare the functional outcome of patient with intertrochanteric fractures treated by two different fixation devices, the extramedullary dynamic hip screw fixation and the intermedullary proximal femoral nail. Our study consists of 50 patient with 50 intertrochanteric fractures out of which 25 was treated with DHS and 25 with PFN.

Age Distribution

The age of the patient ranged from 32 to 86 years with an average of 62 .6 years. In case of Dynamic hip Screw fixation it was 62 .4 years and in cases of proximal femoral nailing it was 62 .8 years.

All the fractures that occurred in patients younger than 58 years were either due to a fall from height or a road traffic accident. This supports the view that bone stock plays an important role in the causation of fractures in the elderly, which occur after a trivial fall. No attempt was made to measure the degree of osteoporosis by the Singh index, as it involves a great inter-observer variability and depends on good quality x -rays. In addition, the accuracy of the Singh index has been questioned by authors such as Koot et al.[11]

White and colleagues 12 did a study of rate of mortality for elderly patients after fracture of the hip in the 1980's and they concluded that the average age for inter - trochanteric fractures is 65.4years.

The average age in our study nearly correlates to that of White and his colleagues.[12] In similar studies done by Hardy,[9] Baumgertner35 average age incidence was 79 years in both the studies.

Sex Distribution

In our study there were 24 males and 26 females showing female preponderance. Dahl and colleagues,[13] in their study 53% of patients were females, explained by the fact that female are more prone for the osteoporosis after menopause .so when an elderly had a trivial trauma she developed inter trochanteric fracture. Sex distribution in our study correlates with that of other studies.

Mode of Injury

Commonest mode of injury is trivial fall which was noted in 36 (72%).History of fall from height and RTA was in 14 (28%) patients. All the fractures that occurred in patients younger than 58 years were either due to a fall from height or a road traffic accident. This supports the view that bone stock plays an important role in the causation of fractures in the elderly, which occur after a trivial fall. In a similar study conducted by, Baumgerner,[10] trivial fall is a common mode of injury 75 percent in elderly people above 70 years of age to cause inter trochanteric fractures.

Fracture Classification

Our series consisted of 28 stable and 22 unstable intertrochanteric fractures as classified according to Jensen and Michealsen's modification of Evans classification. The distribution of stable and unstable fractures in both groups was similar. Out of the 28 stable fractures, 12 were in the DHS group and 16 in the PFN group. Out of the 22 unstable fractures, 13 were in the DHS group and 9 in the PFN group

Pre-injury Walking Ability

The pre-injury walking ability was similar in both groups of patient with DHS or PFN. 80 percent of patients in the DHS group and 75 percent of the patient in the PFN group were walking without support prior to the injury. 22. 5% of patients in the study had grade 2 walking ability prior to fall. This is explained in the fact that intertrochanteric fracture occurs in elderly patient.

Length of Incision

The length of the incision in the DHS group ranged from 14 cms to 18cm with a mean of 16.15 cm as compared to mean of only 8.1cm in the PFN group. The length of the incison varied based on the built of the patient. Patients who are obese required a larger skin incision for the DHS. The smaller incision inthe PFN group meant that there was less intra operative blood loss. This was comparable to the study conducted by Baumgaertner et al,[10] with a mean of 17 cms. DHS and 9 cms PFN

Duration of Surgery

The duration of surgery in the DHS group ranged from 85 minutes to 105 minutes with a mean of 87.25 minutes. The duration of surgery in the PFN group ranged from 60 minutes to 90 minutes with a mean of 69.5 minutes. The difference in the operative times in both groups was found to be highly significant and we attributed this difference to the smaller incisions in the PFN group. Baumgaertner et al,[10] also found that the surgical times were 10 per cent higher in the DHS group in their series with a mean of 70 minutes for DHS and 63 minutes for PFN. Saudan and colleagues 8 found that there was no significant difference between the operative times in the two groups in their series with a mean of 62 minutes. Our findings are in contrary to the study conducted by Hardy,[9] where they found the operative time required for PFN was more when compared DHS..In a similar study conducted by Chaitanya and associates 17 it was found that operative time required for DHS was more when compared to PFN.

Fluroscopy time

The fluoroscopy time in the PFN group (average 73.75 sec) was significantly higher as compared to that of the DHS group (average 57.5 sec). This was similar to the series by Baumgaertner and associates 10 who also found a significant difference in the fluoroscopic times in their series, with 10 per cent higher times for the PFN group. However in their study Saudan et al.[8] found no difference between the fluoroscopy times in both the groups.

Blood loss

The DHS patients had significantly more blood loss intra -operative compared to PFN group (average 235ml more). In patients operated with This is similar to the series by Baumgaertner and associates 10 who also found a significant difference in the intra operative blood loss in their series, with 150ml higher for the DHS group. This finding is in accordance with the reported series by Hardy 9 with mean blood loss of 144ml in P.F.N Group and 198 ml in D,H.S group. In a similar study conducted by Chaitanya and associates 17 there is more amount of blood loss in the cases operated with Dynamic Hip Srew when compared to PFN.

Complication

Results of treatment of stable and unstable fracture have usually been reported together in the literature, and it is generally accepted that with increasing security of fracture pattern (stable to unstable), there is a higher risk of complication and poor outcome.

The occurence of femoral shaft fractures does not seem to be a major problem with the PFN due to a narrower distal diameter as compared to other intramedullary nails. Also, rotational control is inherent in the nail design and is not dependent on multiple parts that are likely to increase the risk of mechanical failure. Due to the smaller diameter lag screws in these intramedullary nails, the proximal aspects of the nail do not need to be flared to prevent mechanical failure of the nail and hence requires less reaming of the proximal femur, thereby reducing the risk of iatrogenic proximal femoral fracture.[14] This was similar to the findings of Saudan et al8 in their study. Other studies have also reported femoral shaft fracture rates of 0 -2 .1 per cent.[15,16] The most common complication association with gamma nail in studies by Hardy36 was fracture femur at the tip of the gamma nail, we did not encounter any such intraoperative complication in this study. The absence of this complication is believed to the due to introduction of valgus angle (6 deg. to 10 degrees) by various manufacturers in the P.F.N compared to original gamma nail which had no valgus angle which caused gamma nail to abut against the anterior cortex causing stress fracture. In a similar study done by Chaitanya and associates 17 there was no such femoral shaft fracture.

The only complications we encountered in this series were malunion, screw back out and wound infection. There was no significant difference between the two groups with regards to time of fracture union as all fracture united at 12 weeks in case of DHS and 12.15 weeks in case of PFN. 5 patients (20 percent) in the DHS group had malunion whereas 1 patient (4%) in the PFN group had malunion. There was statistically significant difference between the two groups regarding malunion.

In our series 2 patients of the DHS group had wound infections as compared to single patient in the PFN group, which was not statistically significant. We attributed the higher number of wound infections in the DHS group to the longer incisions and subsequently more soft tissue handling in this group as compared to the PFN group. However all were only superficial wound infections and healed with short course of antibiotics without any further surgical intervention. All infections occurred in the early post op. period within 14 to 21 days. Higher antibiotics according to culture and sensitivity are used and In all cases, union occurred & no patient required implant removal as a result of infection. In similar study conducted by Chaitanya and associates 17 out of 30 patients operated with DHS only one patient developed wound infection wheras among 30 patients treated with PFN there was no case which developed wound infection. Similar study conducted by Hardy 36 reported that cases treated with PFN had less chance of wound infection when compared to cases treated with DHS. Saudan and associates 8 also did not find any significant difference between the infection rates in the two groups in their series.

In this study the average limb length shortening of patient in DHS group was 1.25cm as compared to 0 .575cm in PFN group which was significant. This could be due to sliding of the lag screw in the DHS group, allowing greater fracture impaction, as compared to the PFN.[17] Four of the twelve patients in DHS with fair or poor results had 2 cm or more shortening, while 2 patient in PFN with fair result had 2cm or more shortening.

In this study the average limb length shortening of patient in DHS group was 1.25cm as compared to 0 .575cm in PFN group which was significant. This could be due to sliding of the lag screw in the DHS

group, allowing greater fracture impaction, as compared to the PFN.[17] Four of the twelve patients in DHS with fair or poor results had 2 cm or more shortening, while 2 patient in PFN with fair result had 2cm or more shortening.

One patient (4 percent) in our study had a hip screw back out. This was seen in the DHS group involving an unstable intertrochanteric fracture. However these patients were relatively mobile and hence re -operation was not necessary. There was no implant cut out in the PFN group which was similar to the studies by Menezes and co -workers 75 (0.7 per cent) In a similar studyconducted by Chaitanya and associates 79 out of their 30 patients treated with DHS one case had screw cut out. The cancellous screw cut out the femoral neck superiorly causing loss of fixation. Improper screw position, failure to maintain the Tip Apex distance (T.A.D) & poor bone quality were found out to be the causes. screw cut out was also reported as most common complication associated with D.H.S group by Hardy 36 with incidence of one out of fifty cases.

Post-Operative Pain

In our study we found there was significant difference in the post-operative pain in the two groups. Even though 21 of DHS and only 15 of the PFN patient had post-operative pain. 3 out of 21 patients in DHS had severe pain compared to none in PFN patients. It was noted that in PFN patient who had moderate pain had wound infection post operatively. Saudan and colleagues 8 found that the amount of persistent pain was similar in both groups in their series.

Post-Operative Range of HipMovement

The average range of motion the hip joint was 84.25 degree in the DHS group and 98.75 degree in the PFN group at 6 months of follow up. Hence, in our study the patients in the PFN group regained a significantly better range of motion as compared to those in the DHS group (p=0 .002). This is comparable to the results put forth by Saudan and colleagues.[8]

Functional Outcome

The overall functional outcome of patient treated PFN was significantly better compared to DHS (P=0 .152). However when we compared the stable and unstable fractures separately, we found that there was no significant difference in the outcomes of the stable fractures in the two groups (p=0 .56). While comparing the unstable fractures in the two groups we found that the functional outcome of the patients in the PFN group was significantly better (p=0.045) than the outcome of the patients in the DHS group with good results for 8 7 .5% of the unstable fractures treated with PFN compared to only fair and poor results for 90% of the unstable fractures treated with DHS. In our series, only 6 of the 25 compared to 17 of the 25 patients (68 per cent) in the PFN group at the fourth month of follow up. Similar findings were seen in the series by Pajarinen and group 17 with a study sample of 108 patients and 54 patients treated with DHS and 54 treated with PFN, they obtained a p value 0.040. This suggests that the use of PFN may be favored in unstable fracture when compared to DHS. There is some amount of shortening seen in the DHS group which can be explained as due to significantly greater impaction of the fracture in the DHS group.

The smaller incisions, shorter operative times, relatively less blood loss and less postoperative pain with the PFN indicate that the PFN has an advantage over the DHS even in the treatment of stable intertrochanteric fractures where the functional outcomes are similar. In addition, with unstable intertrochanteric the PFN has a definite advantage over the DHS in terms of less limb length shortening, earlier restoration of pre -injury walking ability and a better overall functional outcome.

CONCLUSION

The outcomes of the stable fractures treated with either DHS or PFN were similar Unstable intertrochanteric fractures, treated with PFN, had significantly better outcomes with all patients having good results. We conclude that in stable intertrochanteric fractures, both the PFN and DHS have similar outcomes. However, in unstable intertrochanteric fractures the PFN has significantly better outcomes in terms of earlier restoration of walking ability. In addition, as the PFN requires shorter operative time and a smaller incision, it has distinct advantages over DHS even in stable intertrochanteric fractures. Hence, in our opinion, PFN may be the better fixation device for most intertrochanteric fracture of femur.

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